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Synthesis of Pure Aromatic Glycidyl Esters for Use as Adhesives

An extensive laboratory study was conducted to synthesize pure glycidyl esters of aromatic acids and to convert the resultant epoxy esters to polymers for use as adhesives over a range of temperatures down to -423°F .

Diglycidyl phthalate and diglycidyl terephthalate, for example, have been prepared by other investigators from glycidol and the appropriate aromatic acid chlorides in the presence of the base, triethylamine. The disadvantage of the earlier procedure is that glycidol itself polymerizes exothermally in the presence of a base and thus forms a byproduct which contaminates the desired pure product. The improved procedure which has been developed involves low reaction temperatures and the addition of the acid chloride at a slightly faster rate than that of the triethylamine. Many of the pure crystalline products synthesized in this program have been reported by earlier investigators as resins.

The pure aromatic glycidyl esters were polymerized to high molecular weight materials by reacting them with amines and anhydrides. These polymers were then applied as adhesives to test panels and subjected to physical testing for adhesive strength over a range of temperatures.

Several of the adhesives, which have been made, were found to meet most of the temperature requirements, but did not have the proper T-peel strength

when cured at 73°F . As the adhesives become more flexible to meet the T-peel requirements, the tensile shear strengths at 250° and 400°F begin to decrease. Consequently, it was not feasible to prepare adhesives meeting the tensile shear requirements and having a T-peel strength in excess of 10 lb/in. It appears that curing at room temperature is sufficient for some of the epoxies where high tensile shear strength at 400°F is not required. Curing at elevated temperatures produces a more cross-linked adhesive which shows greater rigidity and lower T-peel strength, but good tensile shear strength at the elevated temperatures.

Note:

Inquiries concerning this investigation may be directed to:

Technology Utilization Officer
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Huntsville, Alabama 35812
Reference: B67-10647

Patent status:

Inquiries about obtaining rights for the commercial use of this invention may be made to NASA, Code GP, Washington, D.C. 20546.

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